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Income and Fiscal Impacts of Manufacturing Plants in Southeast Ohio

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INTRODUCTION

Rural residents in southeast Ohio are interested in expanding employment opportunities. But they have questions about the impacts of different types of firms on the cost of providing public services, on the environment, and on the economic welfare of the community. They also have questions about the type of community tools to use in increasing employment. And there are questions about how to accurately, yet economically, assess these issues. This research bulletin reports on a procedure which can be used to examine these questions.

Stimulation of economic development was cited as the most important perceived need by 1,474 respondents in a 1975 study of five southeast Ohio counties (12).[2] Some 46% of the respondents marked this as their most important perceived problem, with another 27% indicating it as the second or third most pressing need. However, the respondents were undecided about using tax support to attract industry. More than half (53.2%) were undecided or opposed to the use of tax revenues to support industrial development efforts. The authors concluded that: "It is possible that many people in the undecided category could become involved but would obviously have to assess the nature of the development effort before becoming actively engaged in the change programs" (12, p. 15).

The competition between communities for employment opportunities is increasing (2, p. 88). As this competition increases, communities will need to offer greater inducements in order to expand employment. Since these inducements involve public sector costs, the communities need a means of determining the maximum bid which they can make. If the level of inducements offered is too great, the new plants may have adverse rather than beneficial impacts on the community. If the level of inducements offered is too small, the community foregoes the opportunity to benefit from the expansion of local job opportunities.

Income and fiscal impact studies of industrialization have been done scarcely, if at all, in Ohio. Local officials in the GROW region indicate that the only fiscal impact study completed in that region was for the Gavin Power Plant and deep shaft coal mines (5). A number of local public officials have indicated an interest in a tool which would help them estimate the economic impacts of new or expanding industries. This would allow them to develop local estimates and would assist them in deciding the appropriate types and levels of local inducements to offer new industry. In this fashion, they could pursue a more aggressive employment creation program with manageable levels of risk.

Frequently communities have looked at changes in their tax base independently from changes in public sector expenditures which might result from industrialization. More recently larger communities have examined both the additional expenditures and additional revenues resulting from industrial development programs. Some of these studies have been done through consultants while others have developed this capability in their planning departments. In small rural communities, however, neither the financial nor technical expertise has existed to permit this type of impact analysis.

The reaction to economic development efforts is likely to vary among groups. For local merchants and realtors, industrial development means additional population and consequently additional consumers. Unemployed workers may benefit directly from expanded job opportunities. Employed workers may benefit directly by opportunities to move to higher paying jobs. Employed workers may also benefit indirectly as the demand for labor increases, pushing wages upward and improving job security. Taxpayers, schools, and other public service providers are usually hopeful that the tax base will increase more rapidly than new expenditures for local services. If this happens, the tax burdens can either be reduced for the original residents or the quality of services provided can improve. Since this outcome sometimes does not occur, taxpayers may not always favor industrial development. Present employers may or may not welcome the increase in industrial activity. In some cases new firms will result in agglomeration economics leading to a favorable attitude among

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[2]The five counties are Athens, Gallia, Jackson, Meigs, and Vinton. These counties are referred to as the GROW Region, where GROW stands for Generating Rural Ohio Wealth. These five counties are the region Ohio selected for study under Title V of the Rural Development Act of 1972.

TABLE 1.—Employment and Income Characteristics by County, GROW Region, 1970-1976.

County	Reported Unemployment Rates*		Adjusted Unemployment Rates†		Manufacturing Employment*		Manufacturing Establishments*		Median Family Income‡		Percent Below Poverty Line‡
	1970	1976	1970	1976	1970	1976	1970	1976	1970	1976	1970
Athens	4.7	8.9	8.4	18.3	1,719	1,221	34	39	7,628	10,354	13.1
Gallia	8.1	8.9	16.7	13.5	437	893	20	25	6,915	8,887	19.1
Jackson	9.6	10.0	17.0	22.1	2,060	2,599	39	56	6,635	8,674	20.5
Meigs	8.5	6.7	24.4	6.7**	401	386	17	20	6,485	9,186	22.1
Vinton	6.6	9.0	16.9	13.1	495	637	18	25	6,334	8,446	19.9
GROW Region	7.0	8.7	14.8	15.6	5,112	5,736	128	165	7,162	9,401	17.6
Ohio	5.3	7.8	5.3	7.8	1,403,801	1,293,631	13,612	16,228	10,313	14,648	7.6

*Ohio Bureau of Employment Services, Division of Research and Statistics.
†Calculated as described in text.
‡U. S. Census and Sales Management data.
**Due to the high rate of participation in this county, this rate was not adjusted.

original industries. In other cases, the increased competition for local labor may drive up the wages of all local employees, resulting in an unfavorable attitude toward new industrial prospects.

The objective of this study is to develop and test a model for examining the income and fiscal impacts of new or expanded manufacturing plants in rural communities. The income impacts examined are the net income to employees at the plant, the net income to other employees filling vacancies when plant employees shifted jobs, and the net income to local merchants and service sector employees. The fiscal impacts studied include changes in net revenues for city and county governments and for school districts. This study gives new emphasis to plant employee benefits (13), in addition to examining local service sector benefits (17). In addition, the distribution of benefits between local communities, the county, and the region are examined.

The objective of this study is accomplished by developing a general simulation model and then applying it to 11 firms in the counties of Athens, Gallia, Jackson, and Meigs. First, previous research on the income and fiscal impacts of industrialization conducted in other areas is examined. Second, a conceptual model is developed for measuring the impacts of expanded or new firms. Third, the characteristics of the firms and employees examined in this study are discussed. Fourth, estimates of the impacts of each firm are presented and analyzed. And fifth, conclusions are drawn and policy implications and future research needs discussed. This study is unique in adding a definition of incremental income to the private sector benefits, in providing a matrix of the economic and fiscal impacts, and in providing a practical means of estimating county income multipliers.

THE STUDY AREA

The GROW region, consisting of Athens, Gallia, Jackson, Meigs, and Vinton counties, can be characterized by high unemployment levels, low incomes, and a relatively high percentage of families in poverty. Table 1 provides data on each county for 1970 and 1976. During the period of 1970-1976, three of the counties had considerable growth in their manufacturing employment. Some of this growth was offset by losses in the other two counties.

Since 1970, unemployment rates in these counties have generally been higher than in Ohio. These rates are reported by the Bureau of Employment Services and appear to understate the actual level of unemployment. Only those workers who register as unemployed with the Bureau of Employment Services in order to find work or are actively seeking employment are reported as unemployed. Housewives and

others who have not sought employment through the Employment Bureau are not considered part of the labor force. In areas with high unemployment and few job opportunities, many potential workers do not actively seek work.

To provide an alternative estimate of unemployment in the region, Ohio labor force participation rates are used to estimate the labor force. While labor force participation is influenced by expected wage rates, marital status, health, other income sources, and for women by the presence of children and day care centers (3, 16), these estimates do provide an alternate view of employment in the region. It was assumed that the same percentage of working age population would seek employment in the GROW region as in the state of Ohio, 74.2% for 1970 and 71.8% in 1976. Multiplying these rates by the county working age population gives the number of potentially employable persons in each county. Dividing the county employment by the potentially employable population and deducting this ratio from one results in the adjusted rate of total unemployment presented in Table 1. In 1970 the adjusted unemployment rate ranged from 8.4% for Athens County to 24.4% for Meigs County. In total, the GROW region had an unemployed labor pool of 9,271 persons. In 1976 the unemployment rates ranged from 6.7% to 22.1% with a total unemployment pool of 10,445 persons.

During the period 1970-1976, employment provided by manufacturing in the GROW region increased by 624 jobs. However, two counties lost employment; Athens lost 408 manufacturing jobs and Meigs lost 15 jobs. The number of establishments increased by 37. While all counties had an increase in the number of firms, Jackson had nearly half of the new firms with 17 additional firms.

The 1970 median income levels for these five counties range from only 61% to 74% of Ohio's median income of $10,313. The percentage of families in poverty in 1970 was between two and three times that of the entire state.

INCOME AND FISCAL IMPACTS OF INDUSTRIALIZATION IN RURAL AREAS: PREVIOUS RESEARCH

Research on the income and fiscal impacts of industrialization in rural areas has been given increasing emphasis during the past 5 years. This stems in part from shifts in rural-urban migration patterns since 1970. Population grew faster in nonmetropolitan counties than in metropolitan counties between 1970 and 1973, reversing previous migration trends (19). In rapidly growing areas environmental groups have started to oppose growth, citing adverse social, environmental, and fiscal impacts. However, many other rural areas have had stable or declining populations. In many of these areas, citizens hope to revitalize their economic base by attracting new industry. The added competition for branch plants is forcing these communities to carefully consider the maximum inducement which they can offer to attract new jobs. In both rapidly growing and declining communities, there are added pressures to carefully examine the income and fiscal impacts of growth.

The private sector economic impacts of industrialization have been extensively investigated since 1945. Summers *et al.* provide a summary of United States case studies conducted between 1945 and 1972 which examine the employment and income effects of rural industrialization (18). The fiscal impacts of rural industrialization have received increasing attention during the last 5 years.

Fiscal impact analysis involves the estimation of incremental revenues and expenditures accruing to local governments and school districts as the result of community growth or decline. Several authors have examined the fiscal impacts of new or expanded industries in rural areas (6, 7, 10, 15). Hirsch (6) developed one of the first complete models of the public sector impacts. This conceptual model has been followed by most of the subsequent research.

The fiscal impacts of industrialization on St. Louis SMSA schools was studied for the year 1955 (7). Hirsch estimated the impacts of a $1 million change in the final demand for each of 60 industrial sectors. Estimates of net impacts made without state aid to education were considerably lower than when the estimates included state aid.

Rosner and Barrows estimated the public sector impacts of a $10 million plant on property taxes in 20 rural Wisconsin towns (15). Initially, they estimated the increase in tax revenues available for schools, county, and towns associated with a new plant. This revenue increase was used to determine the break-even increase in public sector costs which could occur without causing any change in the previous property tax rates. This approach allows the researchers to avoid some of the extremely difficult issues in estimating changes in public sector costs while pinpointing those firms which may merit additional attention.

Only a few studies have included analyses of both the private and public sector impacts of rural industrial development (4, 17, 20). Since the simulation model which is developed in this study follows these works closely, they will be reviewed in more detail.

Garrison studied the public finance impacts of industries locating in five small Kentucky towns between 1958 and 1963 (4). In four of the five com-

munities, local financial inducements were given to the new industries. As a result, six of the eight firms resulted in a negative impact on the local units of government. The magnitude of these impacts was relatively small for city and county government but somewhat larger for school districts. Negative impacts were reversed in three of the communities when a longer time span was considered. This was due to the eventual termination of tax abatement provisions used to attract the firms.

Shaffer and Tweeten examined the impact of 12 industrial plants in eastern Oklahoma (17). The plants were quite small, employing from 10 to 108 persons. Private sector primary and secondary benefits were defined as the additional plant payrolls spent locally. The gross plant payroll was adjusted by a local income multiplier and the propensity to consume locally for both commuters and local workers. In the private sector the annual net gain ranged from $37,472 to $352,016, with an average of $168,809 per plant. More than 99% of the benefits accrued in the private sector with less than 1% divided between the school and municipal government.

The net fiscal revenues were estimated for both city governments and school districts. Additional revenues included property taxes from new homes, expanded industrial property taxes, and increases in state and federal aid due to increased local incomes. Incremental costs included capital and operational expenditures as well as utility expenses. The net gains to municipal government range from a negative $2,521 to a positive $3,246 per plant. School district net gains varied from a negative $815 to a positive $2,617. While one-fourth of the public sector impacts were negative, none of the impacts were large when considered on a per family basis or when compared to private sector gains.

Using the Shaffer-Tweeten procedure, Uhrich estimated the private and public impacts of the 3-M firm on Brookings, S. D. (20). The 3-M plant was estimated to generate an annual net gain of $73,230 for the municipal government, $94,101 for the school district, and $2,982,138 for the private sector.

CONCEPTUAL BENEFIT-COST MODEL

Benefit-cost analysis is an approach for estimating the public and private impacts of investment programs. Rural industrialization efforts frequently involve public subsidies for inducements. The estimation and comparison of benefits and costs for specific firms or specific community policies can assist local leaders in their evaluation. If the benefits from any policy do not exceed the cost of that policy, the alternative is to move to another policy or even to forego action.

Benefits are any outcomes resulting from projects which are favorable or desired by the people involved. The benefits from local industrialization programs include: 1) increases in income to employees at new or expanded plants, 2) increases in income to other residents of the region filling vacancies created by workers at the new plant, and 3) increases in the income of local merchants and their employees as well as other service industries.

Plant employee benefits are defined as the net incremental income accruing to resident workers of the manufacturing plant.[3] Net incremental income is the difference between current earnings and the earnings from the employee's previous job or from transfer payments such as unemployment compensation. Additional social security taxes are deducted because they are deferred income. Additional federal and state taxes are not deducted, however. Additional property and income taxes paid to local governments are deducted and included as revenues to the public sectors. A resident worker is one who resides in the community in which the plant is located. In this study the incremental income of workers who migrated to the community is included as a plant employee benefit. There were few migrating workers, so the results would be similar regardless of the inclusion or exclusion of their incremental income. Expenses incurred in taking the new employment, such as increased transportation costs, moving costs, and union dues should be deducted from the income stream. Estimation of these costs was beyond the scope of this study.

Many of the jobs which employees at the new or expanding plant vacate in older established firms are refilled. Other employee benefits are defined as the net incremental income accruing to the employees filling these vacancies. A chain reaction may occur where a series of employees move up the job ladder filling vacancies created by an employee moving to the new plant. Each of these will experience a net increase in income. If it is assumed that the last person in this job ladder was unemployed, then the sum of the net incremental income to the plant employee and all of the workers in his job ladder would equal his gross wages at the new plant, adjusted for additional local taxes and transfer payments.

The concept of primary income benefits in this study includes all additional income earned by community residents (13). This concept differs from most previous work, exemplified by Shaffer-Tweeten (17), of including only additional local consumption expenditures as primary income benefits. Based on Oakland *et al.*, the major justification for this change

[3]The appendix provides mathematical equations and definitions for each type of benefit and cost.

in concept is that community residents are better off by the total amount of increased income, and not only by that amount spent in the local community (13).

Service sector benefits include benefits to local merchants and their employees in the service sector and intermediate industries. Service sector benefits are defined as the change in income or value added in the service sector resulting from changes in local consumption expenditures. Value added is the sum of wages, rent, interest, and profit from additional sales. The primary benefits to the service sector are the total employee benefits spent locally times the value added/sales ratio. Primary service sector benefits are part of local employee benefits and cannot be added to the employee benefits to determine total local benefits.

Secondary benefits to the service sector are defined as incremental consumption expenditures times the local income multiplier minus one. Two modifications were made which reduced the value of secondary benefits accruing to the community as compared to previous research. First, it is not assumed that secondary benefits accrue instantaneously, but rather over a period of 6 years. A relationship developed by Johnson (9) is used:

$$1)\ M_t = (1 + a) - \frac{a}{25}(t - 5)^2,\ t = 0 \ldots 5$$

where M_t is the multiplier in year t. In year 0, M_t equals 1, and in year 5 increases to $(1 + a)$ and remains at this level in succeeding years. Secondary benefits equal $(M_t - 1)$ times incremental consumption in year t. The impact of equation 1 is to reduce secondary benefits in early years as compared to the assumption of instant benefits, and to reduce the present value of secondary benefits when discounted. The second adjustment affects only the local level. In the Shaffer-Tweeten research, local multipliers were estimated by multiplying the county multiplier by the local average propensity to consume (17). However, the local propensity to consume is already incorporated in the local service sector benefits. Further, there is no reason to expect that the county and local multipliers are related through the local propensity to consume. In this study, the local multiplier is obtained as the product of the county multiplier $(M_t - 1)$ times the ratio of local population to county population. It is assumed that this ratio reflects the proportionate ability of the local community to generate income within the county. This change results in smaller local secondary income multipliers as compared to the Shaffer-Tweeten approach.

Another benefit which is frequently mentioned is the appreciation of property values and housing values. In general, this is not included in benefit cost analysis because this benefit is displaced by a cost to individuals who wish to purchase these properties in the future. This type of benefit, generally referred to as a pecuniary benefit, results from changes in the price level rather than from a real increase in goods and services available.

In addition to these private sector benefits, there may also be benefits in the public sector. For example, if additional tax revenues expand more rapidly than expenditures, the burdens on the community's original taxpayers may be reduced. Tax rates might be reduced or alternatively the quality and quantity of local governmental services might improve.

For township or municipal and county governments and schools, estimates were made of incremental revenues and incremental expenditures due to the new firms. Government net benefits are incremental revenues minus incremental costs for each unit of government. Incremental revenues due to the firms were collected from additional property and local income taxes. Incremental costs due to the firms were the additional operational expenditures. In estimating the additional revenues, only the additional assessed value of new firms' building and equipment and new housing was included. Since property taxes paid by firm workers are transfer payments from the private sector to the public sector, the private sector benefits were reduced by the amount of these transfers. This allows aggregation of the private and public sector benefits without double counting. Each unit of government is treated separately.

Some social changes may be beneficial for the community. New leadership may be developed or brought in as new industry comes to the community. The community's ability to solve other local problems might also be increased. These types of social benefits are not measured in this study.

Costs are any unfavorable outcomes of the project. Costs of rural industrialization projects include the investment costs of public service facility expansions and the cash payments for special locational incentives such as constructing access roads or utility extensions, and the opportunity costs of foregone projects. Opportunity costs show the value of the benefits from the next most attractive use of unpaid resources which are foregone as a result of undertaking a project.

Communities, acting through elected officials, make inducement decisions. In order to maintain their positions elected officials need to consider the benefits and costs of inducement decisions of specific groups, *e.g.*, plant employees, other employees filling vacated jobs, local merchants and their employees, taxpayers, and public service users. The distribution of

benefits and costs of industrial growth among groups is likely to affect growth policies and elected officials' willingness to use public funds to encourage economic development. Consequently, reliable information is needed on the distribution of the impacts of industrial growth.

The annual flows for each component of net benefits are presented to examine the impact of each firm on the specific groups (1). This matrix impact technique helps local leaders foresee which groups will benefit from and which will lose from proposed industrial development policies. Since the benefits for some groups include aspects of benefits shown for other groups, the benefits shown for each group cannot be summed or double counting will occur. As a final step, the annual flows of benefits are aggregated (eliminating double counting) to show the total flow of benefits for each plant.

Since the benefits and costs of industrial development projects occur over different time intervals, all benefits and costs must be discounted to one point in time to examine the feasibility of a project. Using benefit-cost techniques, the most appropriate criterion for the evaluation of manufacturing firms is net present value or net gain. The net present value of a project is the difference between the present or discounted value of benefits and the present value of costs. There are important issues concerning the expected time period over which benefits and costs will occur and the interest rate at which to discount future benefits and costs. In this study, none of the governmental units incurred capital costs or offered inducements to the manufacturing plants being examined, so the only concern is with the level of investment or inducements which could have been offered. For illustrative purposes, the net benefit flows are discounted at 6% over 20 years to obtain estimates of net present value or net gain.

The net gain provides an estimate of the maximum level of inducement which a community can use to attract a new firm. At this level of inducement, the community is just as well off with or without the new firm. A higher level of inducement would result in net losses to the community. Lower levels of inducement suggest that the community would have net gains if development occurred, but would also increase the probability of not obtaining the development. In sum, the present value of net benefits technique provides information about the limits to which a community can go in offering inducements to new firms. The politically acceptable level of public sector investments or inducements is also affected by the distribution of net benefits to the various groups affected by the firm.

To examine the internalization of benefits, the net benefits are calculated at the local, county, and regional levels. Internalized benefits are benefits received by residents of the respective local, county, or regional community. The local level is the municipality or township in which the plant is located. The county level includes all benefits internalized by the county. The regional level includes all benefits internalized by the five-county study area but excludes benefits accruing outside the five counties.

DATA BASE AND FIRM CHARACTERISTICS

The data base for this study consists of a labor questionnaire completed by 93 employees of the 11 manufacturing plants, information obtained from interviews with the managers of each plant, interviews with local government and school officials, and numerous public sources. The labor questionnaire asked employees to respond to questions about current and previous employment and about the location of consumption expenditures. It was sent to 319 employees or 51.1% of the new employees in the 11 firms. Firms 1 and 2 had samples of 13% and 33% of the employees, respectively, while in the rest 100% of the employees were sampled. Mail and telephone follow-up were used to increase the response rate, in particular for less skilled workers. Ninety-three employees completed the survey for a response rate of 31.4%. The respondents are reasonably representative of the employees of the 11 firms, but the least skilled workers are probably under-represented by a small amount.

The 11 manufacturing plants were selected from a total of 23 plants in the region which were established or significantly expanded employment from 1970 to 1974. The firms selected for this study are representative of the types of manufacturing firms which operate in the region. The goal was to select 10 to 12 firms which represented the types, sizes, and community location of firms in the region. New firms or firms which recently expanded operations were selected in order to obtain current information on wage and employment changes for workers and on public revenue and expenditure changes related to the firms. Of the remaining 12 firms, several were larger branch plants which refused to participate and the remainder were small firms which were not contacted. The 11 firms are not a representative sample of the population of manufacturing firms nor of the population of new and expanding firms in the region. The results show the impacts of 11 typical firms of different types in various communities of the region.

Characteristics of the 11 plants in the study are presented in Table 2. Two of the plants are nondurable manufacturing and employ both male and female labor; the other nine are durable and employ

TABLE 2.—Characteristics of Plants Surveyed.

Firm No.	No. of Workers	N or E† (No. Added)	Average Wage ($/Hour)	Previously Employed (percent)	Worker Residence (No.)			
					Local	County	Regional**	Outside Region
1	275	E (175)	3.73	60	96	58	21	0
2*	228	N	2.51	35‡	140	33	3	52
3	150	E (80)	3.85	40	25	10	35	10
4	88	E (44)	3.61	47	17	23	0	4
5	70	E (24)	3.18	33	15	9	0	0
6*	44	N	2.95	9	23	13	4	4
7	17	N	4.18	100	6	11	0	0
8	3	N	3.00	33	0	3	0	1
9	3	N	3.00	100	0	3	0	0
10	3	N	3.00	100	0	3	0	0
11	3	N	4.00	33	3	0	0	0

*Non-durable manufacturing firm employing female labor (firm 2, 65% female and firm 6, 48%); all other firms are durable and employ no female labor.

†N is a new firm, E is an expanded firm with the number of added workers in parentheses.

‡This is a reorganized firm but is treated as a new firm. It is estimated that 35% of the labor force (the percent of males in the work force) could obtain alternative employment.

**The region includes Athens, Gallia, Jackson, Meigs, and Vinton counties.

no female labor. Seven plants were new firms beginning operation after January 1970, while four had employment expansions after this date.

The weighted average hourly wage of new employees was $3.21, ranging from $2.51 for firm 2 to a high of $4.18 for firm 7. The low wage rates for firms 2 and 6 are associated with being non-durable manufacturing firms and employing high proportions of female labor. The proportion of female labor for firm 2 was 65% and for firm 6 was 48%.

Plant employees were considered to be previously employed if they had been employed within 6 weeks prior to obtaining employment with the plant. Some 62% of the new plant employees were previously employed (Table 3). Of the previously unemployed plant workers, 84% were unemployed for more than

TABLE 3.—Characteristics of Plant Workers.

Age

<20 yrs.	21-30 yrs.	31-40 yrs.	41-50 yrs.	>50 yrs.
2%	38%	21%	19%	21%

Education

Not High School Graduate	Completed High School	Vocational	Some College
43%	47%	4%	6%

Skill

Unskilled Low Skilled	Skilled
30%	70%

Income

Up to $3,000	$3,000-$4,999	$5,000-$7,499	$7,500-$9,999	$10,000-$12,499	$12,500-$14,999
2%	25%	49%	15%	7%	2%

Previous Employment Status

	Unemployed					
Employed	Up to 6 wks.	7-13 wks.	13-wks.-6 months	6-12 months	More than 1 yr.	Total
62%	6%	10%	12%	8%	2%	100%

6 weeks, 58% for more than 3 months, and 26% for more than 6 months. The use of the 6-week cutoff for previous employment is arbitrary. A shorter cutoff period would result in higher previous unemployment rates and in higher primary benefits to plant employees. Its impact on estimated benefits is discussed below. Note that the two firms with the highest percentage of previously unemployed workers employed women and paid the lowest average wages.

Table 2 also shows where the workers resided in relationship to the plant location. Local workers reside in the same municipality or township as the plant. Regional workers reside in one of the five counties in the region but outside of both the county and muncipality in which the plant is located. Of those who live outside of the municipality, 27% live in the same county in which the plant is located, while the total number living outside the county is more than 21%, nearly evenly divided between those in the region and outside the region. The local residents include both those individuals who resided there prior to the establishment of the plant and in-migrants from outside the area. Approximately 9% of the employees migrated to the municipality in which the plant was located. Only 43% of the jobs in these plants have gone to individuals originally in the same muncipality in which the plant was located. As will be pointed out later, this implies the need for county-wide or broader cooperation in industrial development efforts.

As Table 3 indicates, the new employees were primarily young and middle-aged, with 40% 30 years old or less and only 21% aged 50 or more. Educational levels of the plant employees were low, with 43% having less than a high school diploma and only 10% having more than a high school diploma. Gross annual earnings for the plant employees were low, with only 24% above $7,500. Some 49% of the plant worker respondents reported their pay as between $5,000 and $7,499. The second largest group, 25%, reported their earnings as between $3,000 and $4,999. Only 9% of the employees earned more than $10,000.

The *average propensity to consume locally* is the proportion of the workers' disposable income spent locally on consumption goods. This includes expenditures for food, clothing, recreation, medical, transportation, and household items. Expenditures for savings and housing are not included. Table 4 shows the average propensity to consume locally, *i.e.*, in the municipality or township where the plant is located, and the number of respondents on which the computations are based. For example, plant workers in firm 2 who resided in the same city as the plant spent 53% of their disposable income there. Firm 2 workers living in the county, but not in the city, spent 35% of their income in the plant's city, while firm 2 workers living outside the county spent only 3% in the city where the plant was located. The right hand side of Table 4 shows the average propensities of all workers to consume locally, in the county, and in the region. This means that all plant employees in firm 2 spent an average of 39% of their disposable income locally, 51% in the county, and 57% within the region.

As workers' incomes increase, they may not spend the same percentage of their additional income on local consumption goods. The marginal propensity to consume locally (MPCL) is the proportion of incremental disposable income spent locally. To estimate the local service sector benefits, the marginal propensity is more relevant than the average propen-

TABLE 4.—Propensities to Consume Locally by Plant and Worker Residence, GROW Region, 1975.

	Average Propensity to Consume Locally				Average Propensity to Consume by All Workers*		
Firm	No. of Respondents	by Local Residents	by County Residents	by Regional Residents	in Local Area	in County	in Region
1	14	0.29	0.16	0.40	0.26	0.47	0.60
2	15	0.53	0.35	0.03	0.39	0.51	0.57
3	23	0.30	0.27	0.40	0.31	0.37	0.48
4	10	0.68	0.03	—	0.28	0.58	0.62
5	8	0.56	0.68	—	0.60	0.71	0.77
6	12	0.45	0.48	0	0.38	0.42	0.48
7	3	0.34	0	—	0.12	0.78	0.90
8	3	—†	0	—	0	0.45	0.54
9	1	—	0	—	0	0.60	0.60
10	3	—	0	—	0	0.51	0.60
11	1	0	—	—	0	0.64	0.85

*Weighted Average Propensity to Consume is weighted by worker residence.

†The symbol — indicates that none of the workers in the plant lived in this region. Consequently, the average propensity to consume locally cannot be defined for these cases.

sity to consume locally (APCL). Table 5 illustrates the relationship between marginal propensity to consume and location of residence as estimated from the labor questionnaire data. As expected, local residents spend a higher percentage of their additional incomes in the same community (44%) than do plant workers commuting from the county (30%) or the region (12%). Similarly, county residents spend more than half (55%) of their additional income within the county while employees from outside the county only spend 24% of their income in the county where the plant is located. This illustrates the importance to the local service sector of the employment of local people.

Although marginal propensities are conceptually superior, average propensities were used in the benefit estimates. There were not sufficient sample observations to control for variations in all factors such as community size, plant size, and worker residence expected to affect the marginal propensity to consume. It was not possible to estimate the variation in marginal propensities to consume in different communities. This variation of consumption behavior in different communities is reflected by the estimated average propensities to consume.

County and regional multipliers were calculated from estimates of the ratio of endogenous income to total income for each county and the region. The multipliers are defined as:

$$2)\ M_i = 1/(1 - d_i),$$

where d_i is the ratio of endogenous to total income.[4] Endogenous income is that income originating within the local economy rather than outside it.

Endogenous income was estimated by sector of the county or regional economy. For durable manufacturing, non-durable manufacturing, construction, retail trade, wholesale trade, finance, transportation, communications, and services, quarterly data from the Bureau of Employment Services on employment from 1972 through 1975 was used to estimate

$$3)\ E_{ik} = b_{oik} + b_{iik}E_{wk},$$

where E_{ik} is employment in the ith county or the region in the kth sector, and E_{wk} is employment in a benchmark region determined by the type of sector and the area affecting its employment (11). A benchmark region is the area to which employment in the county or regional economy is expected to respond. For durable manufacturing the benchmark region was the United States, while for non-durable manufacturing it was Ohio. The ratio of b_{oik}/E_{ik} adjusted for any seasonal or structural changes over the period is the proportion of endogenous employment in the kth industry for the ith area. This ratio is then assumed to be the proportion of endogenous income for the sector.

Estimates of endogenous income from the government sectors, property, transfer payments, residence adjustment, and mining had to be obtained by less formal techniques. Factors such as output, consumption, source of revenues, and use of services or output were examined for each sector. Based on this, a direct estimate of endogenous income was made for each sector. For example, it was estimated that all local government income was endogenous, while all state and federal government income was exogenous.

Once these ratios were obtained, they were multiplied by sector income and summed to obtain total endogenous income for the county or region, from which d_i (the ratio of endogenous to total income) is calculated. The resulting multipliers are presented in Table 6. The region of this study has a relatively high import dependence and low ability to generate income. The multipliers are consistent with other work on the region (8).

TABLE 5.—Marginal Propensity to Consume for Production Workers by Location of Residence and Location of Consumption, GROW Region, 1975.

Location of Consumption	Marginal Propensity to Consume		
	by Local Residents	by County Residents	by Regional Residents
Local Markets	0.44	0.30	0.12
County Markets	NA*	0.55	0.24
Regional Markets	NA	NA	0.75

*Not applicable.

TABLE 6.—Income Multipliers by Level.*

Firm	Local	County	Regional
1	1.11	1.56	
2	1.06	1.64	
3	1.11	1.56	
4	1.14	1.56	
5	1.31	1.64	
6	1.18	1.66	
7	1.03	1.56	
8	—	1.66	
9	—	1.28	
10	—	1.56	
11	—	1.64	
Region			1.75

*Firms in the same muncipality or township have the same local multipliers and firms in the same county have the same county multipliers. All firms in the region have the same regional multiplier.

[4]As discussed earlier, the local multiplier equals the respective county multiplier times the ratio of local population to county population.

BENEFIT-COST CALCULATIONS

The results of the benefit cost calculations for each group affected by a manufacturing plant are discussed first. This is followed by an examination of the total impacts of each firm.

Employee Income Benefits

Plant employee benefits are defined as the additional annual income which is received by resident workers, less additional social security taxes and additional property and local income taxes. Additional federal and state tax payments were not deducted. Employees who were previously unemployed receive benefits equal to their gross earnings, less social security and additional local taxes, and less unemployment or welfare payments received while unemployed. For those who were previously employed, the benefits equal their gross earnings, minus the gross earnings from their previous job, minus changes in social security and local taxes paid.

The plant employee benefits accruing within the region are shown for each firm in Table 7. The region refers to the five counties included in the study area: Athens, Gallia, Jackson, Meigs, and Vinton.

Total annual benefits (additional income) to plant employees within the region range from $3,813 for plant 9 to $580,141 for plant 2, averaging $151,525 per plant. The additional income per worker averaged $2,671 per year, ranging from $1,271 in firm 9 to $5,430 in firm 6. Some 69% of the plant employee benefits occurred within the municipality or township in which the plant was located. Three small firms provided no local plant employee benefits since all employees commuted from outside the local area. Only 8% of the plant employee benefits accrued to persons living outside both the local unit and the county. Incremental benefits per plant employee are identical at the county and regional level for seven firms (firms 4, 5, 7, 8, 9, 10, and 11). None of these firms have workers who reside in the region outside the county of work.

The community's aggregate additional income for plant employees depends on the firm's size, the proportion of the employees living in the community, the firm's wage rate, the number of previously unemployed workers, and the previous wage rate of formerly employed workers. Non-durable manufacturing firms (firms 2 and 6), which pay low wages but employ previously unemployed female labor, generated high levels of plant employee benefits. For example, the large increase of total incremental income in firm 2 is due both to the large number of employees and the high percentage of previously unemployed workers.

While firm 7 paid the highest wage rate, its aggregate impact was smaller than six other firms because of its small size. Although it employed previously employed workers who had earned an average of $3.77 per hour, only firm 6 generated higher incremental income per worker. Firm 6 had more than twice the increase in income per worker as firm 1 but due to its small size it had only 54% of the total impact on the region. It is important to note that two firms the size of firm 6 would produce more income benefits than firm 1, although only half as many people would be employed. This illustrates that communities should consider not only the number of persons employed but also the benefits per worker. In some cases, obtaining several small plants with high benefits per worker will add more income than a single large plant.

TABLE 7.—Plant Employee Benefits by Firm and Location, 1975.

Firm	Regional Benefits			Local Benefits as Percent of Regional Benefits	Local and County Benefits as Percent of Regional Benefits
	Additional Employees	Annual Additional Income per Plant	Additional Income per Worker		
1	175	$440,596	$2,518	60.8	89
2	228	580,141	2,544	82.7	97
3	80	163,115	2,039	64.3	75
4	44	89,670	2,038	71.6	100
5	24	67,193	2,800	84.2	100
6	44	238,898	5,430	62.6	91
7	17	65,912	3,877	21.4	100
8	3	4,590	1,530	0	100
9	3	3,813	1,271	0	100
10	3	5,083	1,695	0	100
11	3	7,767	2,589	100	100
Average	57	151,525	2,671*	69	92

*Average benefits per worker weighted by workers per firm.

Other Employee Benefits

Other employee benefits are the incremental income accruing to persons who filled the jobs vacated when plant employees left old jobs. For example, 105 new employees in firm 1 had previously been employed. As they switched from their old jobs to the new plant, up to 105 additional people were needed to fill their old positions. Previous research has shown that between 7% and 10% of the old jobs go unfilled (17).

Data were not available on the percentage of jobs refilled in the GROW region, on the location of these jobs, or on the residence of workers who obtained these jobs. For the regional estimates shown in Table 8, it was assumed that 50% of the income from jobs vacated and transfer payments foregone within the region was recaptured by regional residents. Of this 50%, it was assumed that 70% of the jobs vacated were refilled by residents of the region and that these were filled by previously unemployed persons. To adjust for previous jobs refilled by nonresidents, 70% rather than 90% is used because 11% of all workers resided outside of the region and 9% of the workers migrated as a result of the manufacturing plant jobs. The remainder is an adjustment for unemployment compensation or welfare payments which were lost when the jobs were taken.

The third column in Table 8 lists the ratio of other employee benefits and plant employee benefits to plant employee benefits. In two cases the addition of other employee benefits more than doubles the gains in regional income. Firm 6 has a very low ratio because 91% of its employees were previously unemployed. In contrast, firm 9 had the highest ratio as a result of only employing previously employed persons.

TABLE 8.—Other Employee Benefits at the Regional Level by Firm.

Firm	Annual Additional Income to Other Employees	Ratio of Plant and Other Benefits to Plant Benefits
1	$363,995	1.8
2	158,783	1.3
3	177,141	2.1
4	68,138	1.8
5	50,611	1.8
6	13,086	1.1
7	57,076	1.9
8	3,589	1.8
9	4,449	2.2
10	4,519	1.9
11	4,943	1.6

Service Sector Benefits

Service sector benefits are defined as the value added from incremental consumption resulting from both an expanded industrial payroll and multiplier effects. Since other employee benefits are based on estimated data and cannot be allocated to counties or local communities, only plant employee benefits are used to derive merchant benefits. Value added is computed as the product of incremental consumption times the average propensity to consume times the value added to sales ratio (Appendix). It shows the net income generated in the service sector.

Table 9 reports the incremental consumption and value added by each firm and the percentage of these benefits accruing locally and in the county. The estimates are based on the U. S. value added to sales ratio of 0.2. Some 43% of the regional service sector benefits accrue outside the local area where the plant is located, 85% of the regional service sector benefits

TABLE 9.—Incremental Consumption and Value Added by Firm and Location of Spending, 1975.

Firm	Regional Incremental Consumption*	Regional Value Added	Value Added per Worker	Local Consumption (Percent of Region)	Local and County Consumption (Percent of Region)
1	$222,561	$44,512	$254	33	76
2	396,557	79,311	348	69	90
3	86,543	17,308	216	53	75
4	60,930	12,186	277	64	90
5	47,177	9,435	393	74	92
6	120,770	24,154	549	76	84
7	43,531	8,706	512	7	87
8	3,900	780	260	0	87
9	2,264	452	151	0	100
10	3,027	605	201	0	85
11	5,986	1,197	399	0	75
Average	90,295	18,059	318	57	85

*These estimates are based on the plant employees' incremental income and do not include other employee impacts. See the text for a discussion of this.

are received within the county. The value added per worker averages $318, ranging from $151 to $549. Value per worker depends on primary benefits and the average propensity to consume in the region.

The service sector benefits from other employee benefits are not included in Table 9. These can be included by assuming that other employees have the same residential and spending patterns as plant employees. If this is assumed, the total value added from other employees' consumption can be obtained by multiplying the regional service sector benefits for plant employees by the ratio of other employee benefits to plant employee benefits. This adjustment changes both the magnitudes and rank of the value added per worker in Table 9.

Secondary benefits to the service sector are computed as consumption expenditures times the income multiplier minus one. The results are in Table 10. The estimated secondary benefits are conservative for two reasons. First, secondary benefits from consumption of employees filling vacated jobs (other employee benefits) are not included for reasons already discussed. Second, since the multipliers adjust for value added and local propensity to consume, a case could be made for applying the multiplier to total incremental income instead of only to additional consumption arising from incremental income. The procedure used in this study results in conservative estimates of secondary benefits to the service sector.

As Table 10 shows, the spillover of benefits from the local unit to the county or region is even more pronounced with secondary impacts. On average, only 8% of the regional secondary benefits are received locally. A total of 69% of the regional benefits are received within the county.

Total incremental secondary benefits depend on the size of the community secondary income multiplier (M — 1), which varies with the level of interdependence between the component sectors of the local economy, the size of the community, and the distance from the nearest urban center. A high propensity to consume locally and thus a high local income multiplier produces a high local share of secondary benefits as in the case of firm 5. By contrast, the low propensity to consume locally, and thus low community multiplier, resulted in a very low local share of secondary benefits for firm 7.

The results reported in Tables 9 and 10 also demonstrate the desirability of regional, or at least county-wide, cooperation in industrial promotion activities. Since many of the benefits from a new firm spill out of the local unit of government, a more aggressive development policy is justified if the entire county participates.

Public Sector Benefits

Public sector benefits include the benefits to local and county governments and to school districts. These are considered separately from the private sector benefits for two reasons. First, public sector budgets need to be balanced even if the private sector benefits are very large. There may be constraints on the use of inducements even if the private sector benefits are very great. Second, individuals affected by changes in tax burdens include many others in addition to those receiving the private sector benefits. In this study, as in most previous studies, the private sector benefits are much larger than the public sector impacts. However, a large portion of the community will not be affected directly by the private sector benefits, but will be affected by any reductions or increases in tax burdens. As a result of these two constraints, it is desirable to consider the public sector impacts separately.

TABLE 10.—Value Added by Secondary Incremental Consumption by Firm and Location of Spending, 1975.

Firm	Regional Value Added	Value Added per Worker	Local (Percent of Regional)	Local and County (Percent of Regional)
1	$166,921	$ 954	5	57
2	297,418	1,304	5	76
3	64,907	811	8	56
4	45,698	1,039	12	67
5	35,383	1,474	31	79
6	90,578	2,059	18	74
7	32,648	1,920	*	65
8	2,925	975	0	76
9	1,698	566	0	37
10	2,270	757	0	63
11	4,489	1,496	0	64
Average	$ 67,721	$1,194	8	69

*Less than 1%.

For the local government sector, additional revenues consist of additional property taxes from the firm and from new homes. Where applicable, the additional city income tax receipts from employees are also included. Additional expenditures for local units of government include the extension of sewer lines, construction of access roads, and the additional expenses for providing services to new firms and inmigrants to the community. Additional revenues and expenditures would also occur from additional income in the service sector and new business resulting from the manufacturing firm. These secondary impacts on the public sector are not included in this study. The net change in revenues for local units of government is the differential between additional revenues and additional expenditures. A similar procedure is used for county governments. User charges for public services are not included because all local government officials indicated that user charges covered the operating costs of providing services.

School districts have additional revenue from property taxes. In addition, they have changes in state aid. Schools may have to add additional facilities and teachers. In some cases there were no additional expenses because of excess school capacity and personnel.

Table 11 presents the annual net benefits for each firm for local and county governments and for each school district. None of the manufacturing plants imposed investment costs on the respective communities. All communities had sufficient excess capacity to provide services to the plants without expanding facilities. There was very little migration of workers as a result of the new or expanded plants under study. The four expanding plants (firms 1, 3, 4, and 5) provided no additional property tax revenues because they did not add to existing plant and equipment. Additional public services financed by user charges are not included because user charges covered additional operating costs in all cases. In addition, these four firms had all employed more workers at some time prior to January 1, 1970, the point at which initial employment was determined. They already possessed sufficient plant and equipment to accommodate the expanded employment. Firm 4 imposed additional costs on the school sector because costs from children of migrating workers exceeded new state aid. Local government revenues from firm 5 resulted from a municipal income tax.

Only firms 2, 6, and 7 appear to have significant impact on all three units of local government. In all cases, except for firm 5, the magnitudes of the impacts are greatest for the school districts. This follows from the fact that school districts levied the heaviest portion of local property taxes. The impacts are

TABLE 11.—Annual Government Net Benefits, 1975.

Firm	Local	County	School
1	$ 0	$ 0	$ 0
2	4,447	4,269	20,047
3	0	0	0
4	0	0	—1,534
5	360	0	0
6	758	1,050	5,970
7	935	1,733	7,702
8	4	16	70
9	14	32	171
10	169	406	1,280
11	39	73	314
Average	$ 611	$ 689	$ 3,093

either positive or zero for all firms with the exception of the impact of firm 4 on the school district. These results illustrate that these 11 firms would have little impact on local tax rates. The annual increases shown in Table 11 are a very small percentage of the local budgets.

How much can a city or county afford to spend on inducements such as extensions of water and sewer lines, building access roads, etc. before taxes increase? Each unit of government could spend an amount equal to the present value of the net benefits to that government before taxes would increase. For purposes of illustration, the present values of net benefits discounted at 6% for 20 years for each unit of government are presented in Table 12. For example, the local governments could not have spent anything on inducements for firms 1, 3, and 4 without increasing taxes, but could have spent about $54,000 in a single first-year investment for firm 2 without any increase in taxes. The actual level of inducement depends on the interest rate and length of time the firm

TABLE 12.—Present Value of Governmental Net Benefits, 1975.*

Firm	Local	County	School
1	$ 0	$ 0	$ 0
2	54,067	51,903	243,734
3	0	0	0
4	0	0	—18,651
5	4,377	0	0
6	9,119	12,766	72,584
7	11,319	21,070	93,642
8	49	195	851
9	170	389	2,079
10	2,055	4,936	15,562
11	474	888	3,818
Average	$ 7,421	$ 8,377	$ 37,602

*Based on 20 years at 6% interest.

is expected to remain in the community. The level of inducement would be less if higher interest rates and/or shorter benefit periods were assumed.

Table 12 again illustrates the importance of cooperation between local government, counties, and schools. For firm 6 the local government could only make an investment of $9,119, while the county could add $12,776 without taxes increasing. If both units offered one-half of these levels, the inducement package ($10,942) would be greater than the local community could offer alone while still reducing the tax burdens of the original residents.

The small net gains for six plants (firms 1, 3, 4, 8, 9, and 11) show the sensitivity of the public sector to additional costs. Even the larger net gains are small compared to the likely cost of expanding public service facilities. If excess capacity had not existed in the communities or if new capital expenditures had been required for attracting these firms in any of the communities, the public sector impacts would probably have been negative. This means local tax burdens would have increased or some current services would have been cut back.

An increase in local taxes as a result of attracting a new firm is not necessarily undesirable. While some communities hope to reduce their tax burdens by expanding the industrial base, other communities may be willing to pay additional taxes in order to expand local employment opportunities. If new firms increase tax burdens, local decisions must be made on the trade-offs between local jobs, public services, and taxes.

Aggregating Community Benefits

Net benefits have been estimated for plant employees, other employees filling vacated positions, local merchants and service sector workers, local and county governments, and school districts. With the exception of the school district for firm 4, the net benefits were positive for all groups. In the case of firm 4, taxpayers had to pay slightly higher school taxes.

The estimated total net benefits per plant and per worker are presented in Table 13. The other employee benefits are included in this table since only regional benefits are shown. When other employee benefits are added, the plants had an average benefit of $306,000 per plant, ranging from a little more than $10,000 to more than $1 million per year. On a per worker basis, the benefits ranged from $3,392 to $9,765, with an average of $5,394. The present value of the net benefits averaged $3.6 million per plant or $63,100 per worker.

What is the distribution of the economic impacts? What percentage of these benefits stay at the local or county level? The total impacts of the private and public sectors are summarized for firm 6 in Table 14. When private and public benefits are summed, the average present value in the region is $3.91 million. The present value estimates are based on a 6% discount rate and a 20-year payback period. More than 97% of these benefits accrue in the private sector. Only 52% of $3.9 million of the private sector benefits accrue within the municipality or township in which the plant is located. An additional 33% of the benefits occur within the county.

TABLE 13.—Annual and Present Value of Total Net Benefits per Plant and per Worker at the Regional Level, by Firm, 1975.

Firm	Total Annual Net Benefits*		Present Value of Benefits†	
	per Plant ($1,000)	per Worker ($)	per Plant ($ Million)	per Worker ($1,000)
1	971.5	5,551	11.46	65.5
2	1,064.5	4,669	12.33	54.1
3	405.2	5,065	4.79	59.9
4	202.0	4,590	2.36	53.6
5	153.5	6,398	1.79	74.7
6	350.3	7,962	4.07	92.5
7	166.0	9,765	1.95	114.7
8	11.2	3,731	0.13	43.3
9	10.2	3,392	0.12	40.0
10	13.7	4,576	0.16	54.0
11	17.6	5,875	0.20	68.3
Average‡	306.0	5,394	3.58	63.1

*Total Net Benefits include plant employee benefits, other employee benefits, secondary benefits to merchants, and public sector benefits.

†The present values are based on a 6% discount rate for a 20-year period.

‡The per worker averages are weighted averages.

TABLE 14.—Impact Matrix of the Present Value* for Plant Six of the Net Benefits by Type of Benefits and Location, 1975.

Type of Benefit	Regional Benefits	Local (Percent of Regional)	Local and County (Percent of Regional)
A. **Private Sector**			
Plant Employees	$2,904,550	63	91
Other Employees†	159,101	†	†
Service Sector‡			
Primary**	293,667	76	84
Secondary	911,932	18	74
Total	3,816,482	52	83
B. **Public Sector**			
Local Government	$ 9,119	100	100
County	12,766	0	100
Schools	72,584	100	100
Total	94,469	86	100
C. **Total Private and Public**	3,910,951	53	86

*Based on 20 years at 6% interest.

†Not included in total and not distributed between local and county levels due to lack of data on the geographic distribution of these benefits.

‡Service sector benefits reported include only the value added to this sector by plant employees' consumption, but not from other employees (see note above).

**While this is a benefit to merchants, it comes from the additional income of plant employees. Consequently, it is not included in the private sector total to avoid double counting.

In firm 6 other employee benefits only increase the total private sector benefits by 3%. This small change results from only 9% of the firm's employees being previously employed. The impact of other employee benefits is much larger in the other 10 firms. It averages 45% of the total of plant and other employee benefits.

CONCLUSIONS

The income and fiscal impacts of 11 new or expanding manufacturing plants in Athens, Gallia, Jackson, and Meigs counties were estimated. The additional employment per firm ranged from 3 to 228 new employees. The estimated impacts are expected to be typical of manufacturing plants in the region. However, the 11 plants do not represent all possible combinations of manufacturing plants and types of communities. A new or expanding plant may have different impacts in future years. The diversity of results suggests that each new or expanding plant needs to be examined individually.

In this study, primary income benefits are defined as all additional income accruing to the residents of the local, county, or regional community. This differs from previous studies which include only the additional consumption expenditures resulting from a new or expanding plant. The incremental income concept used in this study results in much larger primary income benefits when compared to the incremental consumption definition.

The 11 firms studied increased the annual income to plant employees in the region by an average of $151,525 per plant and $2,671 per employee. This increase ranges from $580,141 per year for firm 2 to $3,813 for firm 9. The annual increase in income per employee ranged from $1,271 in firm 9 to $5,430 in firm 6.

The private sector also benefited from increased income to employees filling vacancies created when previously employed persons moved to the new or expanding plants. The local service sector benefited from expanded consumption flowing from the higher incomes. Some 48% of the private sector increase went to employees at the new or expanding plants. Another 33% went to other employees filling vacancies created when formerly employed employees changed jobs and went to the new plant. Nearly 18% of the benefits went to local merchants and their employees as a result of additional spending within the region. About 1.3% of the gains went to local units of government and school districts. About one-half (53%) of net benefits accrued within the community where the plant was located and another 33% in the county.

Local governments could not have made large investments or inducements without raising taxes. For example, assuming a 6% discount rate and 20-year benefit period, the local governments could have invested an average of $7,421. If a 10-year benefit period and 10% discount rate is assumed, then an

average of only $4,130 per plant could have been invested. In addition, the county governments on average could have invested between $4,657 and $8,377, depending on the assumption used, without any increase in taxes. The county investment would be in addition to the local investment. School districts received an average of $3,093 per year more in revenues than they accrued in additional expenses.

In general, local governments, counties, and school districts benefited from these plants. The impacts were not uniform for all plants. In 30% of the cases no benefits were received by these local units of government and school districts, and one school district had greater additional operational expenditures than it did revenues.

Future increases in employment opportunities and population may require additional capital expenditures for public services. At the present time, the communities studied in this research project had excess capacity in their public services and schools so no additional capital costs were incurred. If any capital expeditures or inducements had been needed, the small net gains to the local governments would likely have required tax increases to finance the investment. The small public sector gains from all plants in this study suggest that where public investment is required the tradeoff between added employment and income with increased taxes is an important issue facing local communities.

IMPLICATIONS FOR LOCAL ECONOMIC DEVELOPMENT POLICY

The findings of this research have several implications for local decision makers:

- Nearly all of the benefits of new firms or the expansion of existing firms are in new jobs and higher incomes. More than 99% of the net benefits from the 11 firms studied occurred in the private sector. The average annual gain per employee was $5,394. This suggests that there are strong incentives to encourage additional economic growth.
- Counties and local communities working in cooperation would be justified in being more aggressive in providing assistance to new or expanding firms than either unit working alone, since only half of the benefits accrue in the local community.
- The number of employees in the firm is not related to the benefits per worker. Firms 6 and 7 had the highest benefits per worker and were of relatively small size. A community may benefit more from attracting several small firms than a single large one. Employment levels are also likely to be more stable with several small firms than with a single large firm.
- Some local units of government and school districts will benefit from new jobs but others will not. A few may even incur larger increases in costs than in revenues. To more aggressively promote employment opportunities in this region, it may be necessary for local communities to use tax abatement programs, extension of water lines, construction of access roads, or other local inducements. These inducements will result in public sector costs or the reduction in public sector revenues. As these changes occur, local public officials and local leaders will need a procedure for evaluating the economic and public finance impacts of new industry.
- The economic benefits of new jobs go primarily to plant employees, those filling their previous jobs, and the service sector. The costs of inducing expansion or attracting new firms is borne by taxpayers. Only very weak inducement policies can be undertaken if local governments are unwilling to increase local taxes. Since different persons incur the costs and benefits of economic development, the choice for development involves a local value judgment and must be made through the local political process. Many people are willing to pay slightly more in taxes if it will improve local employment opportunities and incomes. Others are not. The choice is a local one.

ISSUES FOR FURTHER STUDY

The estimation of the economic and public finance impacts of industrialization could be improved in several ways. If local leaders wish to have more refined estimates of the impacts of growth, additional research will be needed on the following questions.

First, estimates are needed on the extent of unfilled previous jobs. As a new plant opens in the community, many of its employees will come from other jobs in the community. The level of benefits to the community is influenced by how many of the vacated jobs are refilled as well as the residential distribution of these workers. Labor surveys are needed on existing plants to develop an understanding of this phenomenon.

Second, in previous fiscal impact analysis it has been assumed that operational costs to schools will increase only if migrants bring in new children. It is implicitly assumed that if there are no migrant children, costs will remain the same as without the plant. But in areas with a high level of unemployment, this assumption may be unrealistic. Information is needed on what would happen to the local population and the number of school children if the plant (or substitutes for it) were not attracted to the community. Would some employees leave, reducing the school age population? If so, at what rate would schools reduce staff and operational expenditures?

Third, on the revenue side, at what rate would downward adjustments occur as housing was abandoned or property values fell? Thus, when unemployment rates are high in the region, it may be reasonable to include some of the existing tax revenues from local employees at a new plant. Research is needed to determine the magnitude of these reactions. Procedures for incorporating this "with and without" perspective into *ex ante* studies also needs additional examination.

Fourth, local policies frequently seem to be insulated from the findings of research such as the current study. New analytical tools such as the model developed in this study frequently are not utilized fully by local communities. While this study provides useful insights into the impacts of 11 local industries, it does not imply that all future industrial development will have similar impacts. In fact, it suggests that each new plant should be studied individually.

Research is needed which would develop a procedure which local leaders can utilize to directly estimate the impacts of potential firms. This procedure would use an accounting approach similar to that used in this study. But it also would need to allow local leaders to estimate the impacts quickly and inexpensively with reasonable accuracy. Furthermore, it should be understandable to local officials but not so simplistic as to ignore major determinants of these economic and fiscal impacts. Hopefully, such a procedure would improve local officials' ability to explain to the general public the relationships determining income and fiscal impacts. Broader public understanding of the impacts of growth should allow local officials to pursue more aggressive employment creation policies.

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APPENDIX
BENEFIT-COST DEFINITIONS AND EQUATIONS

Plant Employee Net Benefits

Each plant employee receives the following net benefits:

$$P_B = (Yd_t - Yp_t) - T_t - U_t$$

where: P_B = net benefits to plant employee
Yd = annual income at the plant
Yp = annual income in previous job
T = increased local taxes paid
U = unemployment compensation and other public assistance foregone by those previously unemployed
t = year

Other Employee Net Benefits

For each position vacated by a plant employee and refilled by other employees, the net gain Po is:

$$Po = (Yp_t - Yo_t) - T_t - U_t$$

where: Po = net gains to other employees
Yp = annual income in the vacated position
Yo = annual income of the other employee in his previous position
T = additional local taxes paid
U = unemployment compensation and other public assistance foregone by those previously unemployed
t = year

Service Sector Primary Benefits

Service sector primary benefits (Vp) are defined as the value added from all additional consumption in the region, county, or local area.

$$Vp = \frac{V}{S}(Y_c \times MPC_w)$$

where: $\frac{V}{S}$ = net value added to retail trade as a percentage of sales
$Y_c = \sum (P_{Bi})$ in the region with i = number of employees
MPC_w = marginal propensity to consume within the region, county, or local area weighted by the residential distribution of the employees

Service Sector Secondary Benefits

Secondary benefits (Vs) are defined as:

$$Vs = Y_c \times MPC_w \times (M - 1)$$

where: $M - 1$ = secondary income multiplier which incorporates the value added element
$= [(1/1 - d) - 1]$
and: $d = ab$
a = average propensity to create income with respect to community value-added to sales ratio
b = average propensity to consume in the community

Net present value of private benefits to all three groups is defined as:

$$NPV_p = \sum_{t=1}^{20} \left(\sum_{j=1}^{n} P_{Bjt} + \sum_{k=1}^{m} P_{okt} + V_{st} \right) / (1 + r)^t$$

where: NPV_p = net present value of private benefits to plant employees, other employees, and local service sector.
t = number of years, $t = 1 \ldots 20$
P_{Bj} = net benefits to plant employee j in year t, with $j = 1$ to n and $t = 1 \ldots 20$
P_{ok} = net benefits to other employee k with $k = 1$ to m and $t = 1 \ldots 20$
V_s = secondary benefits to local service sector, $t = 1 \ldots 20$
r = discount rate

Government Sector Benefits and Costs

In this sector, incremental revenues due to the firm are collected from various sources:

$$R_{gt} = a(F + H)_t + b(Y)_t + \sum_{i=1}^{n} k_i X_{hit} + \sum_{i=1}^{n} q_i X_{fit}$$

where: R_{gt} = revenue in government sector in year t
a = property tax rate
F, H = assessed value, respectively, of firm buildings and equipment and new housing
b = local income tax rate where applicable
Y = new incremental private sector income subject to tax
i = 1 . . . n different types of municipal utilities
k = service charge to households per unit of ith municipal utility
X = units of ith municipal utility
q = service charge to firm per unit of ith municipal utility
f = firm
h = household

Incremental costs due to the firm are those borne by the government sector in delivering various services:

$$C_{gt} = K_{gt} + \sum_{i=1}^{n} d_i(X_{hi} + X_{fi})_t$$

where: C_{gt} = costs in the government sector in year t
K_{gt} = investment costs incurred by the government
d_i = per unit of ith utility provided new households and firm

and other terms as defined earlier.

Net incremental revenues in the government sector in year t are:

$$NR_{gt} = R_{gt} - C_{gt}$$

where NR_{gt} is net revenues. The net present value of net incremental revenues is:

$$NPV_g = \sum_{t=0}^{T} NR_{gt}/(1 + r)^t$$

The above net present value of revenues is relevant to the government sector only.

School District Benefits and Costs

Incremental revenues in the school sector are property tax receipts from the firm and new households and additional aid from state and federal sources for new pupils:

$$R_{st} = b(N)_t + z(F + H)_t$$

where: R_{st} = revenues in the school sector in year t
b = state and federal aid per new pupil
N = number of new pupils from new households due to firm
z = property tax rate

and other terms as defined earlier.

Incremental costs in the school sector relate to incremental investment and operating costs due to new pupils:

$$C_{st} = K_{st} + J(N)_t$$

where: C_{st} = costs in the school sector in year t
J = per pupil operating expenses
K_{st} = capital costs in year t

and other terms as defined earlier.

Net revenues are the difference between revenues and costs:

$$NR_{st} = R_{st} - C_{st}$$

where NR_{st} is net revenues in the school sector in year t.

The net present value of net revenues in the school sector is:

$$NPV_s = \sum_{t=0}^{T} NR_{st}/(1 + r)^t$$

where NPV_{st} is net present value of net revenues in the school sector.

BETTER LIVING IS THE PRODUCT

of research at the Ohio Agricultural Research and Development Center. All Ohioans benefit from this product.

Ohio's farm families benefit from the results of agricultural research translated into increased earnings and improved living conditions. So do the families of the thousands of workers employed in the firms making up the state's agribusiness complex.

But the greatest benefits of agricultural research flow to the millions of Ohio consumers. They enjoy the end products of agricultural science—the world's most wholesome and nutritious food, attractive lawns, beautiful ornamental plants, and hundreds of consumer products containing ingredients originating on the farm, in the greenhouse and nursery, or in the forest.

The Ohio Agricultural Experiment Station, as the Center was called for 83 years, was established at The Ohio State University, Columbus, in 1882. Ten years later, the Station was moved to its present location in Wayne County. In 1965, the Ohio General Assembly passed legislation changing the name to Ohio Agricultural Research and Development Center—a name which more accurately reflects the nature and scope of the Center's research program today.

Research at OARDC deals with the improvement of all agricultural production and marketing practices. It is concerned with the development of an agricultural product from germination of a seed or development of an embryo through to the consumer's dinner table. It is directed at improved human nutrition, family and child development, home management, and all other aspects of family life. It is geared to enhancing and preserving the quality of our environment.

Individuals and groups are welcome to visit the OARDC, to enjoy the attractive buildings, grounds, and arboretum, and to observe first hand research aimed at the goal of Better Living for All Ohioans!

The State Is the Campus for Agricultural Research and Development

Ohio's major soil types and climatic conditions are represented at the Research Center's 12 locations.

Research is conducted by 15 departments on more than 7000 acres at Center headquarters in Wooster, eight branches, Pomerene Forest Laboratory, North Appalachian Experimental Watershed, and The Ohio State University.

Center Headquarters, Wooster, Wayne County: 1953 acres

Eastern Ohio Resource Development Center, Caldwell, Noble County: 2053 acres

Jackson Branch, Jackson, Jackson County: 502 acres

Mahoning County Farm, Canfield: 275 acres

Muck Crops Branch, Willard, Huron County: 15 acres

North Appalachian Experimental Watershed, Coshocton, Coshocton County: 1047 acres (Cooperative with Science and Education Administration/Agricultural Research, U. S. Dept. of Agriculture)

Northwestern Branch, Hoytville, Wood County: 247 acres

Pomerene Forest Laboratory, Coshocton County: 227 acres

Southern Branch, Ripley, Brown County: 275 acres

Vegetable Crops Branch, Fremont, Sandusky County: 105 acres

Western Branch, South Charleston, Clark County: 428 acres